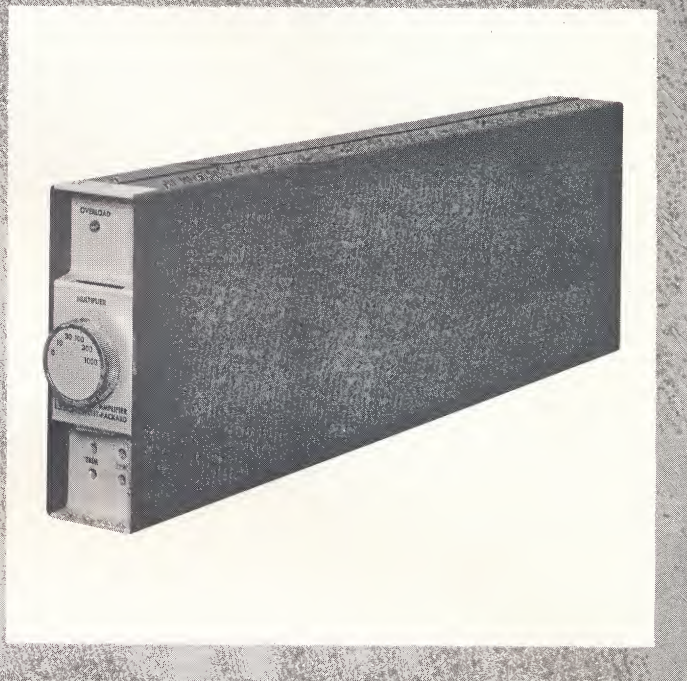


FEATURES

- Differential input provides low drift, 120 db common mode rejection.
- $\pm 0.02\%$ gain accuracy, range to range.
- $\pm 0.002\%$ linearity, both polarities.
- $\pm 0.005\%$ per month gain stability.
- 50 kc bandwidth, 100 μ s settling and 100 μ s overload recovery, for systems applications.
- High input impedance — 1000 megohms for all gain settings.
- Built-in power supply provides maximum isolation, convenient use of individual amplifiers.
- All silicon transistor circuitry for maximum reliability.



APPLICATION

The Model DY-2470A Data Amplifier is a wide-band, high performance amplifier for amplification, normalizing or isolation of signals from dc to 50 kc. Its high common mode noise rejection (120 db) and low zero drift make the DY-2470A particularly well suited to all types of signal conditioning applications. Excellent gain stability, both short and long term, avoids the need for frequent gain adjustment - a real convenience in multiple-amplifier systems - and also allows the DY-2470A to be used for monitoring drift of dc signal sources, in conjunction with a strip-chart recorder.

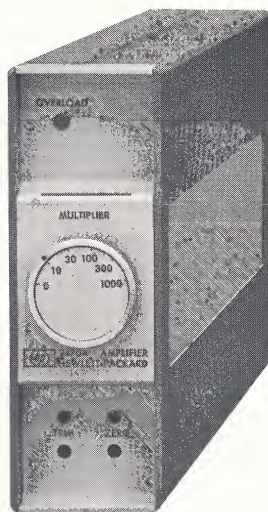
Typical inputs to the DY-2470A Data Amplifier include strain gage bridge transducers, thermocouples, potentiometer pick-ups, and resistance transducers in general. The Amplifier may be used to drive galvanometers, oscillographs, strip-chart recorders, X-Y plotters, magnetic tape recorders, digital voltmeters and analog-to-digital converters, oscilloscopes, meters, and many other devices.

DESCRIPTION

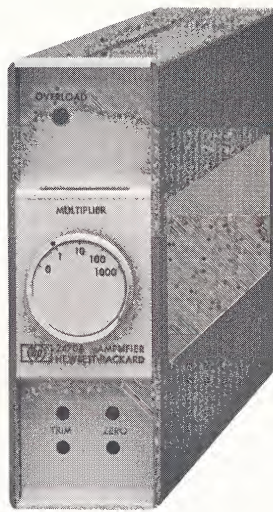
Differential Input

A differential input circuit is used in the DY-2470A Data Amplifier to provide high common mode noise rejection and low zero drift (zero does not have to be adjusted when changing gain setting). Input and output circuits of the DY-2470A are isolated by internally-driven guard shields, permitting separate ground connections for the signal source and the driven load without affecting the common mode rejection. The amplifier's high input impedance - 1000 megohms - minimizes loading of the signal source.

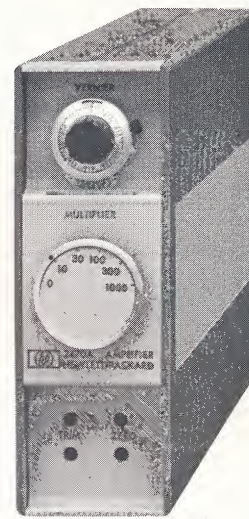
Excellent linearity and gain stability, and also fast settling, have resulted from using differential input circuitry to obtain high common mode rejection instead of a chopper-transformer configuration. Moreover, low zero drift has been achieved without the use of chopper stabilization, with consequent low noise. With no choppers in the instrument, any possible problems from intermodulation distortion and reliability are automatically avoided.



Amplifier with Overload Indication
(Option M4)



Amplifier with X1, X10, X100, X1000
Gain Steps (Option M1)
and Overload Indication (M4)



Amplifier with Gain Vernier
(Option M3)

DY-2470A DATA AMPLIFIERS

WITH STANDARD OPTIONAL FEATURES

Gain Selection

Switch-selected, fixed half-decade gain steps from $\times 10$ to $\times 1000$ are provided by the standard instrument; fixed decade gain steps from $\times 1$ to $\times 1000$ are an optional alternate. A precision attenuator is used which provides a gain accuracy of $\pm 0.02\%$, range to range. (A front panel 'Gain Trim' adjustment with $\pm 1\%$ range and $\pm 0.01\%$ resolution permits closer calibration of the range in use, if desired.)

Special gain steps (up to six steps, $\times 1$ to $\times 1000$ possible range) can be supplied to order. An optional 'vernier' affords continuous adjustment of gain up to 3.5 times the fixed gain setting, by means of a 10-turn, precision potentiometer and turns-counting dial on the front panel.

Output

The DY-2470A output will supply up to $\pm 10\text{V}$ at 100 ma into a resistive or reactive load; the amplifier is not damaged if the load is short-circuited. Fast settling ($< 100\ \mu\text{s}$) and fast overload recovery ($< 100\ \mu\text{s}$) are valuable assets in systems applications. The high slewing rate of the DY-2470A minimizes non-linear distortion and consequent dc offsets when it is used to amplify signals with a large high-frequency content.

Dual Output

A second output, driven from the main output through a buffer amplifier, is optionally available. The bandwidth of the second output can be equal to

or narrower than that of the main output, enabling two devices with differing bandwidth requirements to be driven simultaneously by one amplifier. A short-circuit on the second amplifier output will not affect the main output.

Overload Indication

While the output of the DY-2470A Amplifier is self-limiting, avoiding damage to the instrument in the event of an overload, it is frequently desirable to know when an overload condition exists. A front panel overload indicating lamp and output signal are therefore available as a standard option. This feature is particularly useful in multi-channel transducer monitoring systems, where overloads caused by faulty transducers would be easily spotted before the start of a data run, avoiding loss of data.

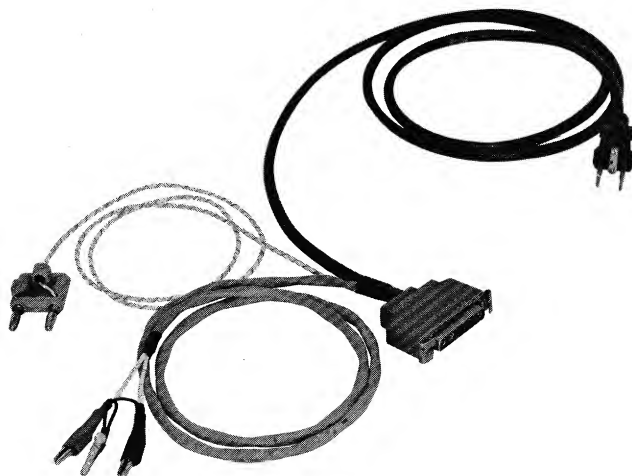
Reliability

Exceptional reliability has been designed into the DY-2470A Data Amplifier by use of hermetically-sealed, silicon transistors throughout the instrument, and by careful selection of passive components for dependability as well as performance.

The predicted mean time between failures (MTBF) for the DY-2470A is more than two years of continuous operation. Moreover, performance specifications of the DY-2470A are guaranteed for operation at ambient temperatures from 0° to 55°C (130°F) and relative humidity to 95% at 40°C (100°F).

BENCH OR SYSTEMS USE

The fully-enclosed design and built-in power supply allow convenient use of individual amplifiers on the bench. All signal and power connections are made through a single connector on the rear panel. An accessory cable assembly mating with this connector provides separate cables for signal input, output, and ac power.

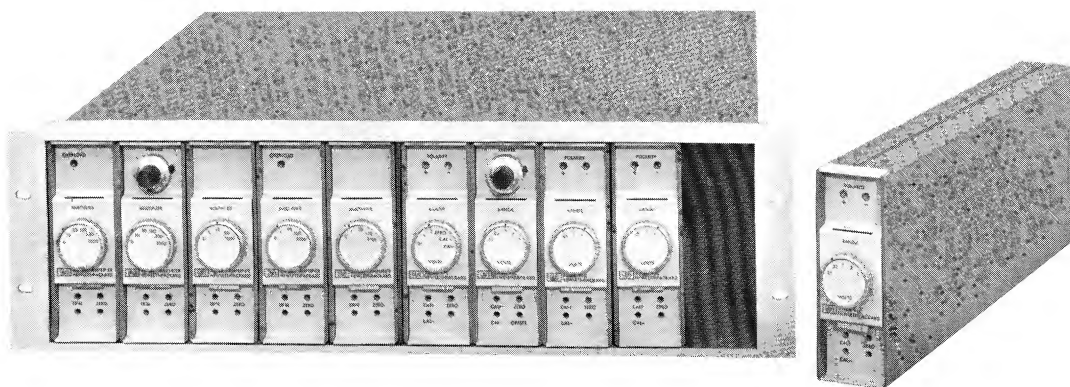


No. 12503A Signal and Power Cable Assembly.



No. 12501A Bench Stand.

Also available is a neat bench stand accessory which supports one amplifier and incorporates signal input and output connectors, ac power switch and lamp, and a power cord.



No. 12500A Combining Case holds up to 10 Amplifiers, may be used on bench or rack-mounted. Combining Case is fully-equipped with all necessary mating connectors.

For systems applications a Combining Case is available which holds up to 10 amplifiers. The Combining Case is fully enclosed and may be used on the bench or mounted in a 19-inch rack, where it occupies only 5-1/4 inches of vertical panel space. Mating connectors for 10 amplifiers, a cooling fan, and a power cord are included in the

Combining Case. Power and systems signal connections are already wired to one power receptacle and one systems connector; analog input and output connections are not wired. Individual blank filler panels are available for covering spaces not occupied by amplifiers.

SPECIFICATIONS

Unless otherwise noted, specifications apply to operation at 25°C after 30-minute warm-up, $\pm 10\%$ line voltage variation, and hold for a 1K source resistance with any unbalance.

DC GAIN

Standard: 5 fixed steps of x10, x30, x100, x300, x1000, selected at front panel. A x0 position shorts the output.

Option M1: 4 fixed steps of x1, x10, x100, x1000, selected at front panel. A x0 position shorts the output.

Special: On special order, any fixed steps between x0 and x1000 can be provided, with a maximum of 6 positions.

Vernier (Option M3): 10-turn potentiometer (front panel) extends gain up to x3.5, for any gain setting.

DC GAIN ACCURACY

$\pm .02\%$ of nominal fixed step. $\pm 1\%$ gain trim with $\pm .01\%$ resolution provided.

Vernier (Option M3):
Dial Accuracy: $\pm 3\%$.
Resolution: $\pm .05\%$.
Resettability: $\pm .08\%$.

GAIN STABILITY

DC: $\pm .005\%$ per month.

AC: $\pm .1\%$ per month, for ac to 2 kc.

Temp. Coeff: $\pm .001\%$ per °C. ($\pm .002\%$ per °C if optional vernier is used.)

LINEARITY

DC: $\pm .002\%$ of full scale, referred to straight line through zero and full scale output. Applies for all gain settings and inputs of both polarities.

AC: $\pm .01\%$ of full scale referred to straight line through zero and full scale output. Applies for all gain settings and inputs to 2 kc.

ZERO DRIFT (OFFSET)

Figures below apply to any gain setting; there is no need to adjust zero on changing gain setting.

Per Day: $\pm 5 \mu\text{v} \pm .5 \text{ namp rti} \pm 50 \mu\text{v rto}$.

Per Month: $\pm 25 \mu\text{v} \pm 2.5 \text{ namp rti} \pm 250 \mu\text{v rto}$.

Six Months: $\pm 100 \mu\text{v} \pm 10 \text{ namp rti} \pm 1 \text{ mv rto}$.

Temp. Coeff. $\pm 1 \mu\text{v}/^\circ\text{C} \pm .5 \text{ namp}/^\circ\text{C rti} \pm 10 \mu\text{v}/^\circ\text{C rto}$.

Note: Current offsets are incurred only with unbalanced sources. Optional vernier increases rto offset by a factor of 2.5.

NOISE

0 to 10 cps	1 $\mu\text{v p-p rti}$	+10 $\mu\text{v p-p rto}$.
0 to 100 cps	3 $\mu\text{v p-p rti}$	+30 $\mu\text{v p-p rto}$.
0 to 1 kc	1 $\mu\text{v rms rti}$	+30 $\mu\text{v rms rto}$.
0 to 10 kc	3 $\mu\text{v rms rti}$	+300 $\mu\text{v rms rto}$.
0 to 50 kc	5 $\mu\text{v rms rti}$	+500 $\mu\text{v rms rto}$.

INPUT IMPEDANCE

1000M shunted by .001 μf .

COMMON MODE REJECTION

120 db at 60 cps, for gain settings of x30 and higher. (60 cps CMR decreases to 110 db at x10, 90 db at x1.) CMR at dc is 120 db for all gain settings.

MAXIMUM INPUT SIGNAL

$\pm 11\text{v}$, differential plus common mode. Combined input up to $\pm 20\text{v}$ will not damage instrument.

OUTPUT

$\pm 10\text{v}$ maximum, 0 to 100 ma. Self-limits at approx. 11.5v, 300 ma.

OUTPUT IMPEDANCE

0.1 Ω in series with 10 μh max.

LOAD CAPABILITY

100 Ω or .01 μf for full output. Amplifier remains stable and is undamaged by short circuit or any capacitive load.

SLEWING

10^6 volts/sec rti, 10^7 volts/sec rto (for inputs of both polarities).

BANDWIDTH

(For any gain step. *)

0 to 50 kc	$\pm 3 \text{ db}$
0 to 15 kc	$\pm 1 \text{ db}$
0 to 5 kc	$\pm 1\%$
0 to 1.5 kc	$\pm .1\%$
0 to 500 cps	$\pm .01\%$

(*With optional vernier, 3 db bandwidth is 20 kc at x3.5 gain setting.)

Note: Other fixed 3 db bandwidths between 100 cps and 50 kc available on special order.

SETTLING TIME

100 μs to within .01% of final value.

OVERLOAD RECOVERY

Settling time plus 100 μs for input* of 10 times full scale. Less than 5 ms for input* up to 20v. (*Signal plus common mode.)

SPECIFICATIONS (Cont'd)

OVERLOAD SIGNAL

(With Option M4.)

-23 to -31v with no overload, 0 to -1v in overload. 5 ma drive capability. Front panel lamp indication.

DUAL OUTPUT

Second, buffered output, with same level and phase as standard output, available as Option M5.

DC Gain: x1 (referred to main output).

DC Gain Accuracy: $\pm 0.01\%$.

DC Gain Stability: $\pm 0.02\%$ per month. (Temp. coeff. $\pm 0.005\%$ per $^{\circ}\text{C}$.)

DC Linearity: $\pm 0.02\%$ of full scale.

Zero Drift: $\pm 0.005\%$ of full scale rto per day. (Temp-coeff. $\pm 0.001\%$ of full scale per $^{\circ}\text{C}$, rto.)

Output: $\pm 10\text{v}$ maximum, 0 to 10 ma. Self-limits at approx. 11.5v, 35 ma.

Output Impedance: 0.5Ω in series with $10\mu\text{h}$ max.

Load Capability: 1K or $.001\mu\text{f}$ for full output. Amplifier remains stable and is undamaged by short circuit or any capacitive load, and main output is affected less than $\pm 0.005\%$.

Slewing: Full output available at specified 3 db bandwidth (3×10^6 volts/sec max. at 50 kc).

Bandwidth: Any fixed 3 db bandwidth between 100 cps and 50 kc, specified by customer. Must be less than or equal to 3 db bandwidth of main output. 12 db/octave slope.

Settling Time: Determined by bandwidth specified.

Overload Recovery: Cannot be overloaded by main output. Recovers from a short on its output in 2x settling time.

REAR CONNECTOR

All signal input/output and power connections at rear connector. Mating connector listed under Accessories Available. Accessory Combining Case includes mating connectors.

Pin Connections:

- | | |
|-------------|------------------------------------|
| 1 | Output common |
| 2 | Overload (with Option M1) |
| 3, 5, 8, 10 | Chassis ground |
| 4 | AC line (fused) |
| 6 | Buffered output common (Option M4) |
| 7 | Buffered output (Option M4) |
| 9 | AC line (return) |

- | | |
|----|-------------------------------|
| A1 | Output |
| A2 | Input (non-inverted terminal) |
| A3 | Input (inverted terminal) |

ENVIRONMENTAL CONDITIONS

Operating: Ambient temperatures from 0 to 55°C . Relative humidity up to 95% at 40°C . When used individually, instruments are self-cooled by convection. Accessory Combining Case includes fan for additional cooling.

Storage: -40 to $+75^{\circ}\text{C}$.

RELIABILITY

Predicted mean time between failures (with 90% confidence) is 20,000 hours - over two years of continuous operation - when operated at 25°C ambient.

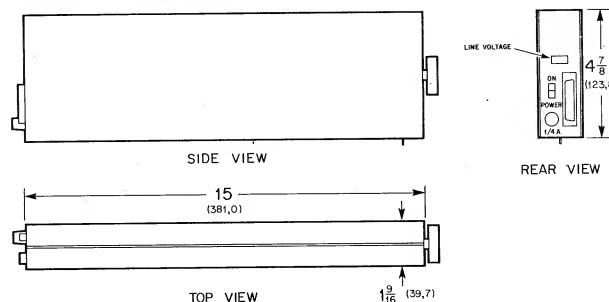
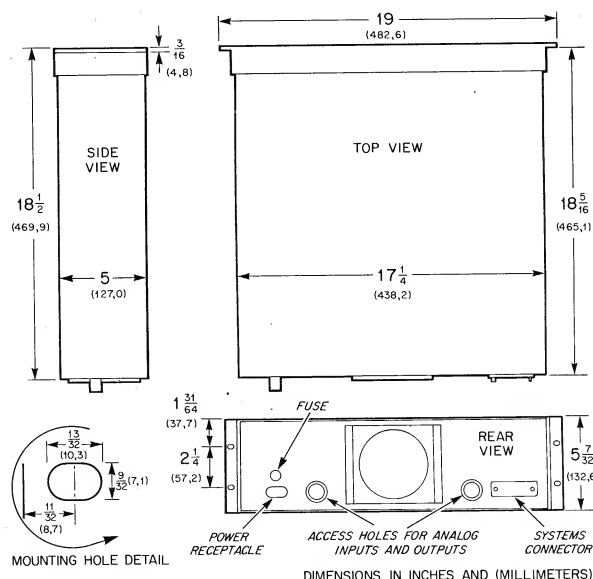
POWER REQUIRED

115/230v $\pm 10\%$, 50 to 400 cps, 8w with no load, 10 w at full load. Fuse, 115/230v and on/off switches on rear panel.

DIMENSIONS

DY-2470A:

DIMENSIONS IN INCHES AND (MILLIMETERS)

**COMBINING CASE:**

WEIGHT

Net wt 4 lb (1, 8 kg); shipping wt 6-1/2 lb (2, 9 kg).

Combining Case

Net wt 12-1/2 lb (5, 7 kg); shipping wt 27 lb (12, 3 kg).

FINISH

Light grey panel; blue-grey texture-finish case.

OPTIONAL MODIFICATIONS

(Order by M-number.)

M1. x1, x10, x100, x1000 Gain Steps (includes x0 shorting position). Add \$25.00.

M3. Gain Vernier: Provides continuously-adjustable gain extension up to x3.5, for any gain setting. Add \$75.00.

M4. Overload Indication: Front panel lamp indication and output signal. Add \$35.00.

M5. Dual Output: Second, buffered output added. Add \$65.00.

Special Gain Steps: Up to 6 fixed steps from x1 to x1000 (can include x0 shorting position). May be combined with Option M3. Price on request.

ACCESSORIES AVAILABLE

(Order by accessory or stock number.)

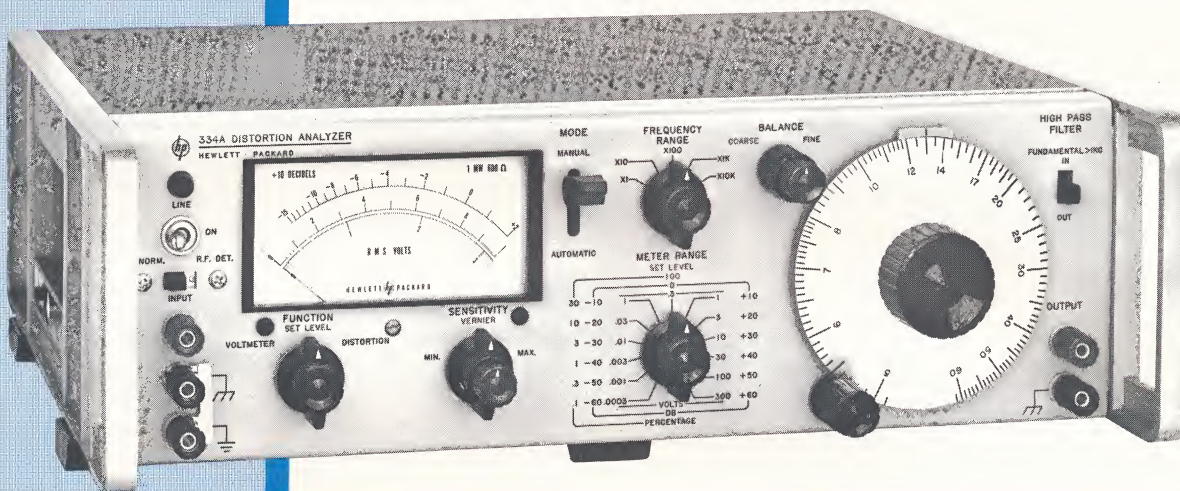
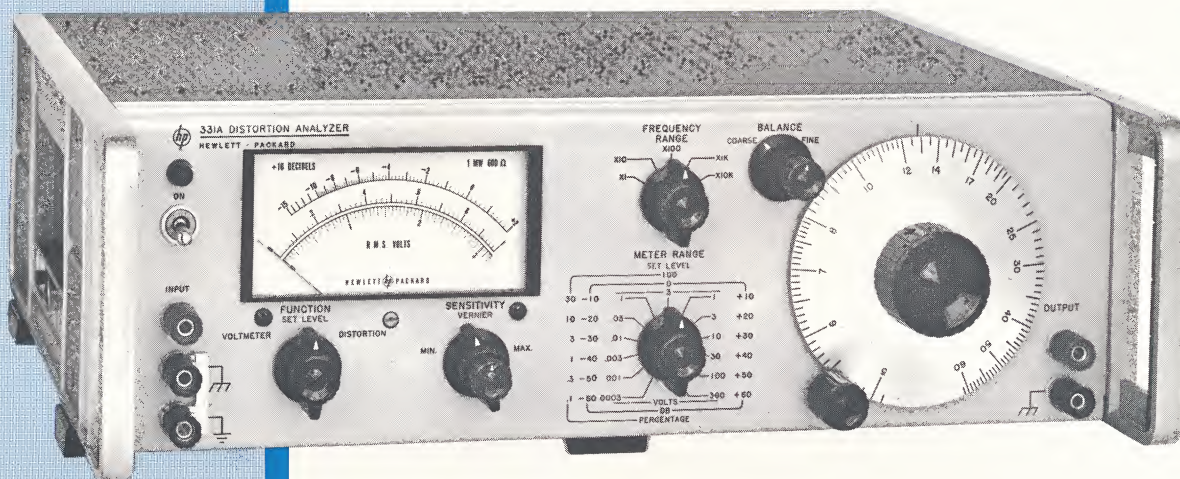
1. Mating Rear Connector (not required if Combining Case is used): Accessory No. 12502A, \$18.00.
2. Signal and Power Cable Assembly: Consists of mating rear connector with 3-foot signal input cable (terminated with alligator clips); 3-foot signal output cable (terminated with 2-pin banana plug); and 5-foot power cable (terminated with NEMA connector). Accessory No. 12503A, \$30.00.
3. Bench Stand: Provides bench support for one amplifier; signal input connectors (two GR plus GR for guard); signal output connectors (BNC, plus GR for chassis ground); and power cable (5 feet, terminated with NEMA connector). Includes power switch with integral lamp. Accessory No. 12501A, \$85.00.
4. Combining Case: Contains up to 10 amplifiers. Includes mating rear connector for each amplifier. AC power connections brought out to single receptacle at rear of case; 7-1/2 foot NEMA-terminated power cable furnished. Access holes provided for signal cables. Equipped with mounting flanges for 19-inch rack. Fan (115/230v) included. Accessory No. 12500A, \$285.00.
5. Blank Filler Panel: For use with Combining Case; covers space not occupied by one amplifier. Accessory No. 12504A, \$10.00.

PRICE

Model DY-2470A Data Amplifier, \$585.00.

(Note: Select Accessory item 1, 2, or 3 above for bench use, or item 4 for systems use.)

TECHNICAL DATA 25 FEB 66



- HARMONIC DISTORTION MEASUREMENT FROM 5Hz - 600KHz, 0.1% FULL SCALE DISTORTION SENSITIVITY
- AUTOMATIC FUNDAMENTAL NULLING
- INPUT SENSITIVITY 0.3V rms FOR 100% SET LEVEL REFERENCE
- MAX. VOLTMETER FULL SCALE SENSITIVITY 300 μ V rms (RESIDUAL NOISE < 25 μ V)

MODELS AND AVAILABLE FEATURES

Model No.	Automatic Fundamental Nulling	Hi-Pass Filter	AM Detector	Gear Reduction Tuning	VU Meter	Rear Input Terminals In Parallel
331A				X	Option: 01	Option: 02
332A			X	X	Option: 01	Option: 02
333A	X	X			Option: 01	Option: 02
334A	X	X	X		Option: 01	Option: 02

ADVANTAGES

1 Megohm input impedance
 Low distortion output for oscilloscope or true RMS voltmeter
 High reduction gear drive aids manual tuning
 Switchable High-Pass Filter attenuates all frequencies below 400 Hz.
 Common input terminals for Voltmeter and Distortion Analyzer
 Floating Input and Output
 Solid State

USES

Measure total broadband distortion
 Measure voltage and amplifier gain
 Measure noise and hum level
 Measure envelope distortion of AM RF carriers

DESCRIPTION

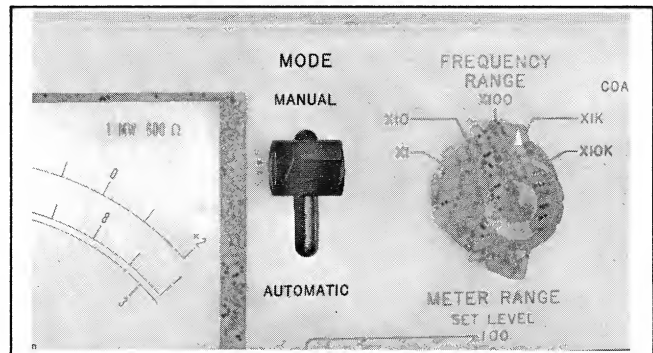
Distortion Analyzers have gone solid state, offering extended tuning range, greater set-level sensitivity, improved selectivity and greater overall accuracy. The Model 331A, 332A, 333A, 334A Distortion Analyzers measure total distortion down to 0.1% full scale at any frequency between 5 Hz and 600 KHz; harmonics are indicated up to 3 MHz. These instruments measure noise as low as 50 microvolts, and measure voltages over a wide range of level and frequency. All four models may be used as sensitive wide range transistorized voltmeters for general purpose voltage and gain measurements.

DISTORTION ANALYZER

The Distortion Analyzer consists of a high impedance broadband amplifier, a tunable frequency rejection circuit, and a metering circuit. The solid state rejection circuit utilizes a capacitively tuned Wien bridge network which provides greater than 80 db of fundamental rejection. Automatic bridge balancing (fundamental nulling) is available in the Models 333A and 334A. Maximum input sensitivity at 0.1% distortion setting corresponds to 300 μ v rms for measuring low-level residuals. Input impedance is one megohm for both voltmeter and distortion operation with a single input terminal being used for both modes of operation.

AUTOMATIC FUNDAMENTAL NULLING

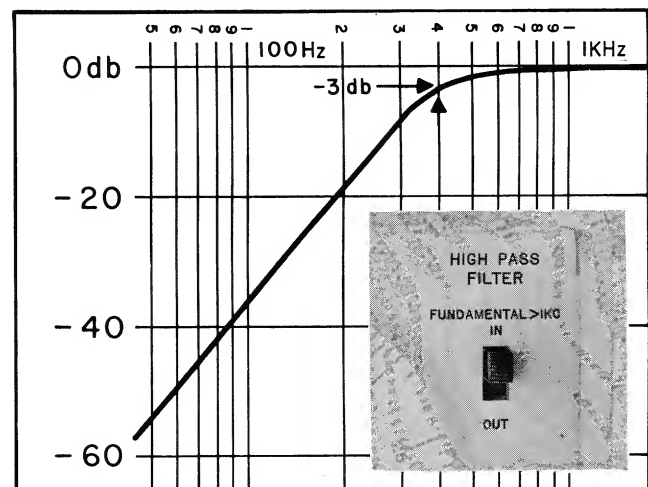
Automatic fundamental nulling speeds up the normally time-consuming portion of the measurement. This is done by manually nulling with the coarse tuning and balance controls to less than 10% of the Set Level Reference. The automatic mode is used to complete rejection of the fundamental on more sensitive ranges without any further manual tuning.



Mode switch on 333A and 334A provides Automatic Fundamental Nulling.

HIGH-PASS FILTER

In order to reduce the effect of hum components, a high pass filter is provided which attenuates frequencies below 400 Hz. The filter may be activated by a front panel switch when measuring distortion of signals greater than 1 KHz in frequency.

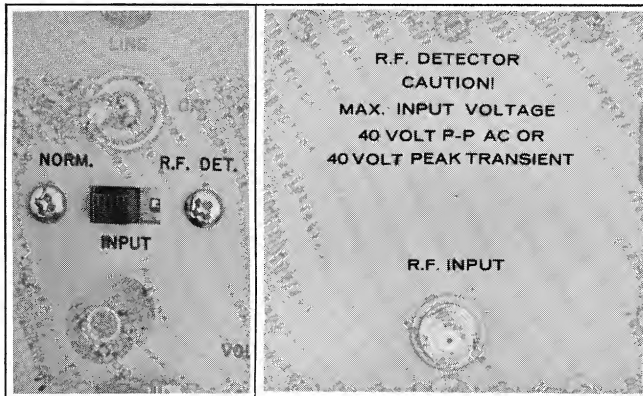


Switchable High-Pass Filter attenuates all frequencies below 400 Hz eliminating hum and noise components illustrated in the typical curve above.

AMPLITUDE MODULATION DETECTOR

The Model 332A or the 334A Analyzers are provided with an amplitude modulation detector having a frequency range from 550 KHz to greater than 65 MHz.

The high impedance dc restoring peak detector which utilizes a semi-conductor diode measures distortion at carrier levels as low as 1 volt. The input to the detector is located on the rear of the instrument. The Model 334A is similar to Model 332A, but is provided with Automatic Fundamental Nulling and a High-Pass Filter.



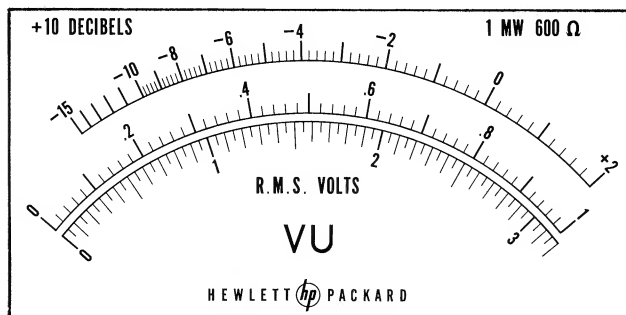
Switchable RF Detector to the input of the instrument has a frequency range of 550 KHz to 65 MHz. Input connector is located in the rear of the instrument.

HIGH IMPEDANCE VOLTMETER

The transistorized metering circuit of the Model 331A through 334A, employs a large amount of feedback to insure stability and a flat frequency response from 5 Hz to 3 MHz. The voltmeter mode offers 13 ranges in 10 db steps. Range is from 300 μ V to 300V rms full scale. The bandwidth is 5 Hz to 3 MHz for the 1 mv to 30 v ranges, 5 Hz to 500 KHz for the 100v to 300v ranges, and 20 Hz to 500 KHz for the 300 μ V range. The average responding meter is calibrated to the rms value of a sine wave.

VU OPTION AVAILABLE

OPTION: 01 provides an indicating meter having VU ballistic characteristics.



VU Meter Scale

REAR TERMINAL OPTION AVAILABLE

OPTION: 02 provides rear terminals in parallel with the front input terminals for direct connection to the analyzers at the rear when rack mounting and used in a system.

MODEL 331A

Distortion Measurement Range: Any fundamental frequency, 5 Hz to 600 KHz. Distortion levels of 0.1%-100% are measured full scale in 7 ranges.

Distortion Measurement Accuracy:

Harmonic measurement accuracy:

Fundamental Input Less Than 30 v

RANGE	$\pm 3\%$	$\pm 6\%$	$\pm 12\%$
100%-0.3%	10 Hz - 1 MHz	10 Hz - 3 MHz	
0.1%	30 Hz-300 KHz	20 Hz-500 KHz	10 Hz-1.2 MHz

Fundamental Input Greater Than 30 v

RANGE	$\pm 3\%$	$\pm 6\%$	$\pm 12\%$
100%-0.3%	10 Hz-300 KHz	10 Hz-500 KHz	10 Hz-3 MHz
0.1%	30 Hz-300 KHz	20 Hz-500 KHz	10 Hz-1.2 MHz

Elimination Characteristics:

Fundamental Rejection > 80 db

Second Harmonic Accuracy for a fundamental of:

5 to 20 Hz: better than ± 1 db

20 Hz to 20 KHz: better than ± 0.6 db

20 KHz to 100 KHz: better than -1 db

100 KHz to 300 KHz: better than -2 db

300 KHz to 600 KHz: better than -3 db

Distortion Introduced by Instrument:

$< 0.03\%$ from 5 Hz to 200 KHz

$< 0.06\%$ from 200 KHz to 600 KHz

Meter indication is proportional to the average value of a sine wave.

Frequency Calibration Accuracy:

Better than $\pm 2\%$ from 10 Hz to 200 KHz

Better than -3% from 5 to 10 Hz

Better than $+8\%$ from 200 to 600 KHz

Input Impedance: Distortion Mode: 1 Megohm shunted by less than 60 ($\times 80$) pf (10 megohms shunted by < 10 pf with Model 10001A divider probe).

Voltmeter Mode: 1 Megohm shunted by 30 ($\times 50$) pf 1 to 300 v rms; 1 Megohm shunted by 60 ($\times 80$) pf, 300 μ V to 0.3v rms.

*With rear input modification.

Input Level For Distortion Measurements: 0.3v rms for 100% set level or 0.245 v for 0 db Set Level. (up to 300 v may be attenuated to set level reference).

DC Isolation: Signal ground may be ± 400 vdc from external chassis.

Voltmeter Range: 300 μ V to 300 v rms full scale (13 ranges) 10 db per range.

Voltmeter Accuracy: (Using front panel input terminals)

RANGE	$\pm 2\%$	$\pm 5\%$
300 μ V	30 Hz - 300 KHz	20 Hz - 500 KHz
1 mv-30v	10 Hz - 1 MHz	5 Hz - 3 MHz
100v-300v	10 Hz - 300 KHz	5 Hz - 500 KHz

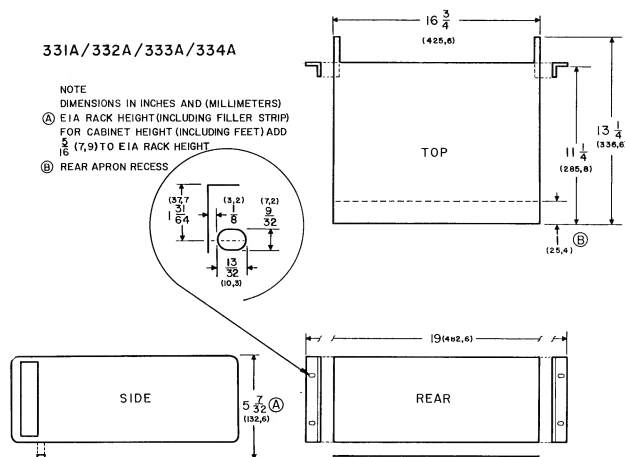
Noise Measurements: Voltmeter residual noise on the 300 μ V range: < 25 μ V rms, when terminated in 600 ohms, < 30 μ V rms terminated with a shielded 100 k resistor.

Output: Approximately 0.1 v rms output for full scale meter deflection.

Output Impedance: 2K.

Power Supply: 115 or 230 volts $\pm 10\%$, 50 to 1000 Hz, approximately 4 watts. Terminals are provided for external battery supply. Positive and negative voltages between 30v and 50v are required. Current drain from each supply is 40 ma.

Outline Drawing:



Weight: Net 17 3/4 lbs. (7,98 kg) Shipping 23 lbs. (10,35 kg).

MODEL 332A

Same as Model 331A except as indicated below:

AM Detector: High impedance DC restoring peak detector with semi-conductor diode operates from 550 KHz to greater than 65 MHz. Broadband input, no tuning is required.

Maximum Input: 40 v p-p AC or 40 v peak transient.

Distortion Introduced By Detector:

Carrier Frequency:

550 KHz-1.6 MHz: $< 0.3\%$ for 3-8 v rms carriers modulated 30%.

1.6 MHz-65 MHz: $< 1\%$ for 3-8 v rms carriers modulated 30%.

Note: Distortion introduced at carrier levels as low as 1 volt is normally $< 1\%$ 550 KHz to 65 MHz for carriers modulated 30%.

MODEL 333A

Same as Model 331A except as indicated below:

Automatic Nulling Mode:

Set Level: At least 0.2 v rms.

Frequency Ranges:

X1, manual null tuned to less than 3% of set level; total frequency hold-in $\pm 0.5\%$ about true manual null. X10 through X10 K, manual null tuned to less than 10% of set level; total frequency hold-in $\pm 1\%$ about true manual null.

Automatic Null Accuracy:

5 Hz to 100 Hz: Meter reading within 0 to ± 3 db of manual null.

100 Hz to 600 KHz: Meter reading within 0 to ± 1.5 db of manual null.

High-Pass Filter: 3 db point at 400 Hz with 18 db per octave roll off. 60 Hz rejection > 40 db. Normally used only with fundamental frequencies greater than 1 kc.

Frequency Calibration Accuracy:

Better than $\pm 3\%$ from 5 Hz to 200 KHz

Better than $\pm 8\%$ from 200 KHz to 600 KHz

Power Supply: Same as Model 331A except current drain from each supply is 80 ma.

MODEL 334A

Same as Model 333A except includes AM Detector described under Model 332A.

Price: 331A \$590.00

332A \$620.00

333A \$760.00

334A \$790.00

Option:01, Indicating meter has VU characteristics conforming to FCC requirements for AM/FM and TV broadcasting; add \$15.00.

► C10-331A, C10-332A, C10-333A, C10-334A, Rear input terminals in parallel; price on request.

Prices f.o.b. factory
Data Subject to change without notice
► Indicates change from prior specifications

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